9:00

735 Increased Myosin Heavy Chain Turnover in Compensatory Hypertrophy Due to Chronic Aortic Regurgitation

Norman M. Magid, Roderick K. King, Jeffrey S. Borer. *Cornell Medical Center, New York, NY*

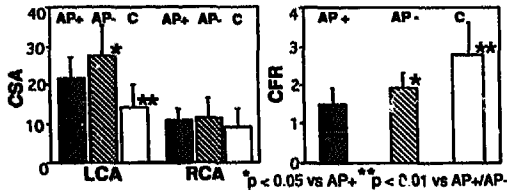
We previously demonstrated dynamic alterations in protein turnover at 3 days and 1 month after surgical induction of aortic regurgitation(AR). To characterize protein fractional synthesis(Ks) and degradation(Kd) during the long-term plateau phase, we performed [^{3}H]-leucine infusions 2 1/2 years after induction of AR in 10 New Zealand White rabbits and 12 sham-operated controls. Ks was obtained by analysis of plasma and protein hydrolysate samples, growth rates(Kg) were determined from protein concentrations and heart weights, and Kd was calculated by subtraction of Kg from Ks. AR (regurgitant fraction 25 ± 11%) caused a 57% increase in left ventricular weight in comparison with controls (7.4 ± 1.7 vs 4.7 ± 0.6 g, $p < 0.001$) and no evidence of heart failure. Although concentrations of total cardiac protein(TCP), myosin heavy chain(MHC) and actin were similar, the enlarged AR hearts had increased amounts of TCP (1,009 ± 312 vs 682 ± 120 mg/LV, $p < 0.05$), MHC (148 ± 91 vs 81 ± 29 mg/LV, $p < 0.05$), and actin (73 ± 42 vs 44 ± 16 mg/LV, $p < 0.06$). Individual protein Ks and Kd were closely balanced. However, MHC fractional turnover rates were 152% ($p < 0.01$) greater than those of TCP in AR animals, while only 52% ($p < 0.05$) greater in controls (AR vs controls, $p = 0.05$). Variations in actin turnover between AR and control animals did not attain statistical significance. MHC and actin Ks values correlated closely in AR rabbits ($R = 0.81$, $p < 0.02$), but not among controls ($R = 0.41$, NS). Thus, a relative increase in myosin heavy chain turnover contributes to the maintenance of increased myofibrillar protein content in the "compensatory" left ventricular hypertrophy of chronic AR.

9:15

735-4 Inadequate Hypertrophy as a Cause for Angina Pectoris in Patients With Aortic Valve Disease

Barbara K. Julius, Martin Spillmann, Bruno Villari, Giuseppe Vassalli, Franz R. Eberli, Otto M. Hess. *Department of Internal Medicine, Cardiology, University Hospital, Zurich, Switzerland*

Background: 40–50% of all patients (pts) with aortic valve disease (AVD) have anginal symptoms despite normal coronary arteries. *Patients and Methods:* 85 pts with severe AVD and normal coronary arteries and 33 controls were included in the present analysis. There were 39 pts with (AP+) and 46 pts without AP (AP–). Coronary cross-sectional area (CSA) was determined by quantitative coronary angiography and coronary flow reserve (CFR) by coronary sinus thermodilution. *Results:* Peak systolic stress was significantly higher in AP+ whereas left coronary CSA, CFR and left ventricular muscle mass were significantly smaller in AP+ when compared to AP–.



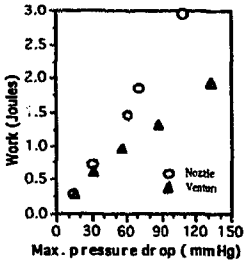
Conclusions: In pts with aortic valve disease left coronary arteries are significantly smaller in pts with than without AP suggesting an inadequate growth of the epicardial vessels Thus, the occurrence of myocardial ischemia may be explained by inadequate left ventricular hypertrophy with an increased wall stress, small coronary arteries and a reduced coronary flow reserve.

9:30

735-5 Pressure Recovery, Not Maximal Orifice Pressure Drop, Influences Left Ventricular Work in Aortic Stenosis

Russell S. Heinrich, Arnold A. Fontaine, Randall Y. Grimes, Aniket Sidhaye, Serena Yang, Robert A. Levine, Ajit P. Yoganathan. *Georgia Tech, Atlanta, GA; Mass. General Hospital, Boston, MA*

The severity of aortic stenosis is widely assessed by Doppler ultrasound in terms of the maximal pressure drop at the orifice. Pressure recovery of varying degrees, however, has been shown to occur downstream of stenotic valves and could potentially affect the workload on the left ventricle. The purpose of this study was to determine whether, for comparable degrees of maximal pressure drop at the orifice, pressure recovery influences pump work. Pulsatile flow (cardiac output = 2–7 l/min) was pumped through a stenotic nozzle or a tapered Venturi shape designed to maximize pressure recovery. Cardiac work was calculated by measuring pressure, flow and velocity at the boundaries of a control volume surrounding the stenosis and applying conservation of energy. The results showed that for comparable maximal orifice pressure drops, the pump work varied with model type and paralleled pressure recovery; the nozzle required the most work (average = 0.99 Joules), while the Venturi required the least (average = 0.69 Joules). Energy loss correlated best with pressure drop after recovery: Energy Loss = −0.04 + 0.006(orifice ΔP), $R = 0.63$; Energy Loss = −0.02 + 0.02(recovered ΔP), $R = 0.97$.



Conclusion: Pressure recovery alters the work needed to pump blood across a stenosis for a given orifice pressure drop, and therefore influences the physiologic impact of stenosis on the pumping ventricle.

9:45

735-6 Diminished Contractile Reserve in Latent Left Ventricular Dysfunction in Mitral Regurgitation: Evidence From a Simplified Model of Pressure-Volume Loop

Dominic Y. Leung, Brian P. Griffin, Brian Haluska, William J. Stewart, James D. Thomas, Thomas H. Marwick. *Cleveland Clinic Fdn, OH*

To assess left ventricular (LV) function at rest and at exercise (Ex) in mitral regurgitation (MR), we performed preoperative Ex echo in 64 pts with no coronary disease and normal resting LV function undergoing valve repair for isolated MR (age 54 ± 13 years, 51 men). These were compared with 10 controls matched for age, sex and resting systolic blood pressure (SBP). LV end diastolic and end systolic volume were measured at rest and after Ex. To construct simplified, rectangular-shaped pressure-volume (PV) loops at rest and Ex, LV systolic pressure was taken to be SBP and LV diastolic pressure was assumed to constant at 10 mmHg. Stroke work (SW) is the area within the PV loop. *Results:* 21 pts (33%) with post repair (postop) ejection fraction (EF) ≤ 50% were considered to have latent LV dysfunction preoperatively.

	EF_{REST}(%)	SW_{REST}(gm)	SW_{EX}(gm)	$\Delta SW_{EX-REST}$(gm)
Postop EF ≤ 50%(A)	60 ± 10	147 ± 43	188 ± 70	41 ± 51
Postop EF > 50%(B)	65 ± 7	154 ± 37	252 ± 81	98 ± 60
p value (A vs B)	0.08	0.5	0.003	<0.001
Controls	69 ± 5	104 ± 19	184 ± 52	80 ± 37

SW_{REST} was higher in pts than in controls ($p = 0.001$). $\Delta SW_{EX-REST}$ was not different in controls and in pts with postop EF > 50% but was significantly lower in pts with postop EF ≤ 50%. *Conclusions:* 1) Ability of LV to increase SW at exercise (contractile reserve) is diminished in MR pts with latent dysfunction, 2) Resting EF and SW_{REST} were not different between pts with and without latent dysfunction, 3)SW_{EX} and $\Delta SW_{EX-REST}$ may be used to identify pts with latent dysfunction.

736 Pretransplant Evaluation

Tuesday, March 26, 1996, 8:30 a.m.–10:00 a.m.
Orange County Convention Center, Room 230B

8:30

736-1 Non-Invasive Determination of Transpulmonary Gradient and Pulmonary Vascular Resistance in Potential Heart Transplant Candidates: Can Right Heart Catheterization Be Avoided?

James H. Stein, Alex Neumann, Lynn M. Preston, Jeffrey S. Soble, Susan M. Quinn, Maria R. Costanzo, Joseph E. Parrillo, Maryl R. Johnson, Richard M. Marcus. *Rush Medical College, Chicago, IL*

Transpulmonary gradient (TPG) and pulmonary vascular resistance (PVR)